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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
BEST, ZACHARY P	

ART UNIT	PAPER NUMBER
4191	

NOTIFICATION DATE	DELIVERY MODE
03/19/2008	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No.	Applicant(s)	
	10/519,097	HENNIGE ET AL.	
	Examiner	Art Unit	
	Zachary Best	4191	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *27 December 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-25* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-25* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *12272004, 03142005, 06212005, 05162006, 06042007*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

ION CONDUCTING BATTERY SEPARATOR FOR LITHIUM BATTERIES, METHOD FOR THE PRODUCTION AND USE THEREOF

Examiner: Z. Best S.N. 10/519,097 Art Unit: 4191 March 12, 2008

Specification

1. Applicant is reminded of the proper language and format for an abstract of the disclosure. The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. **It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided.** The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

Appropriate correction is required.

Claim Objections

2. Claim 1 is objected to because of the phrase "wherein the separator comprises at least one inorganic material which may also contain organic groups and which has lithium ion conducting properties and which is chemically bonded to the inorganic coating" is confusing

as to which element the qualifiers following the word "material" identify. Appropriate correction is required.

3. Claim 3 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Claim 3 recites an admixture, which is indirectly defined in the specification as "within." Claim 1 recites that the inorganic material of Claim 3 is chemically bonded to the inorganic coating, which would inherently make said inorganic material present within the structure of the separator. Appropriate correction is required.

4. Claim 4 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Claim 1 recites that the inorganic material which has lithium ion conducting properties is chemically bonded to the inorganic coating, thereby inherently meeting the limitation that at least part of the material forming the inorganic porous coating has lithium ion conducting properties.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1-12 and 14-21 are rejected under 35 U.S.C. 102(b) as being anticipated by Hying et al. (WO99/62620). (Subsequent references to Hying et al. are based on corresponding U.S Patent No. 6,620,320 B1.)

Regarding Claim 1, Hying et al. teach an ion-conducting composite, which can be used for a most diverse range of applications where ion exchange membranes (separators) are needed (col. 1, lines 7-10). Hying et al. further teach said membrane comprising a substrate having a multiplicity of openings (col. 1, lines 65-66) and having a porous inorganic electrically insulating coating on and in said substrate (col. 2, lines 1-5, 9-21), said coating closing the openings in the substrate (col. 4, lines 23-31), the material of said substrate being selected from felted (nonwoven) polymeric fibers (col. 2, line 65 - col. 3, line 14), and said inorganic electrically insulating coating comprising particles (col. 3, lines 60-62), wherein the membrane is a polysulfone (col. 4, lines 43-50), which is an electrical insulator and has lithium ion conductive properties without the presence of an electrolyte as evidenced by Kubota (U.S. Patent Number 5,254,416 A), wherein the membrane comprises at least one inorganic material which may also contain organic groups (col. 4, lines 51-59), for instance lithium sulfonate, which has lithium ion conducting properties as evidenced by Yamahira et al. (U.S. Patent Number 5,411,820 A) and which is chemically bonded to the inorganic coating (col. 2, lines 57-64 and col. 4, lines 38-42

Regarding Claim 2, Hying et al. teach the particles of the inorganic electrically insulating coating comprise particles of oxides of the elements Al, Zr, and/or Si (col. 6, lines 37-44).

Regarding Claim 3, Hying et al. teach at least one inorganic material which may also contain organic groups and which has lithium ion conducting properties is present as an admixture (i.e., within) in the structure of the separator (col. 2, lines 57-64).

Regarding Claim 4, Hying et al. teach that at least part of the material forming the inorganic porous coating has lithium ion conducting properties (col. 4, lines 51-59).

Regarding Claim 5, Hying et al. teach the inorganic lithium ion conducting material is lithium sulfonate (col. 4, lines 51-59).

Regarding Claim 6, Hying et al. teach that the inner and/or outer surfaces of the oxide particles present in the separator are coated with a layer of lithium ion conducting inorganic material which may also contain organic groups (col. 4, lines 14-22).

Regarding Claim 7, Hying et al. teach the layer has a thickness of 0.001 to 0.05 μm (1-50 nm, col. 4, lines 21-22).

Regarding Claim 8, Hying et al. teach a lithium ion conducting material, being lithium sulfonate, which comprises negative-charge-carrying matrix (sulfonate) and lithium cations (col. 4, lines 51-59, and further evidenced by Yamahira et al.).

Regarding Claim 9, Hying et al. teach the lithium ion conducting material contains ionic groups selected from the group consisting of sulfonates, phosphonates, or mixtures of these groups (col. 4, lines 51-59).

Regarding Claim 10, Hying et al. teach said ionic groups are bonded chemically to the inorganic particles via organic groups (col. 4, lines 38-39).

Regarding Claim 11, Hying et al. teach the ionic groups are attached directly or indirectly via the organic groups or spacers, via Si-O- groups to the inorganic particles (col. 9, lines 42-51).

Regarding Claim 12, Hying et al. teach said organic groups are aryl and/or alkyl chains and the ionic groups are thereby connected to the inner and/or outer surface of the particles present in the membrane (col. 4, lines 39-42).

Regarding Claim 14, Hying et al. separately teach a process for producing the ion conducting material of Claim 1 (col. 4, lines 32-67).

Regarding Claim 15, Hying et al. teach the process comprising treating the separator which does not have lithium ion conducting properties with at least one ion conducting material or with at least one material which following a further treatment has ion conducting properties (col. 9, lines 14-23).

Regarding Claim 16, Hying et al. teach a process wherein the treatment of the separator comprises selecting the material carrying negative fixed charges being selected from compounds which attach to the surface of the inorganic coating via a siloxane group (col. 9, lines 42-51).

Regarding Claim 17, Hying et al. teach a process wherein the treatment of the separator takes place by impregnating, dipping, rolling on (rollercoating), spraying or other coating techniques (col. 9, lines 31-36).

Regarding Claim 18, Hying et al. teach a process wherein the separator is thermally treated (col. 36-41).

Regarding Claim 19, Hying et al. teach a process wherein the thermal treatment is conducted at a temperature of from 80-150 °C (col. 11, lines 46-48).

Regarding Claim 20, Hying et al. teach that the material used to produce the inorganic porous coating has lithium ion conducting properties (col. 4, lines 51-59).

Regarding Claim 21, Hying et al. teach the inorganic lithium ion conducting material used to produce the coating is lithium sulfonate (col. 4, lines 51-59).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hying et al., as applied to Claims 1-12 and 14-21 above, and in further view of Munshi (U.S. Patent No. 6,828,065 B2).

Hying et al. teach an ion-conducting composite as recited in Paragraph 6 above. Hying et al. further teach that the ion-conducting composite material is flexible and preferably bendable to a minimum radius of as small as 1 mm (col. 5, lines 8-11). However, Hying et al. fail to teach the separator is bendable down to a smallest radius of 0.5 mm.

Munshi teaches a separator for a lithium ion battery comprising a polymer material, wherein said polymer material is, among other things, polypropylene (PP), which is a polyolefin (col. 9, lines 2-8). Munshi recognize that the flexibility of the separator is dependent on thickness of the separator (col. 9, lines 2-8). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to adjust the flexibility of the an ion-conducting composite of Hying et al. by changing the thickness because Munshi recognize that flexibility of the separator can be varied depending on separator thickness. Discovery of an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272 (CCPA 1980).

9. Claims 22-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hying et al., as applied to Claims 1-12 and 14-21 above, and in further view of Kawakami et al. (U.S. Patent No. 5,795,679 A).

Hying et al. teach an ion-conducting composite as recited in Paragraph 6 above. However, Hying et al. fail to teach a lithium battery comprising the separator of Claim 1.

Regarding Claim 22, Kawakami et al. teach a lithium ion secondary cell (Kawakami et al. abstract). Kawakami et al. further teach a nonwoven polypropylene ion conducting material, which can comprise polypropylene, is used in either a lithium ion cell or an alkali cell (col. 12, lines 23-25). It is obvious for one having ordinary skill in the art to employ simple substitution of one known element for another to obtain predictable results. *See KSR v. Teleflex*, 127 S.Ct. 1727 (2007). Therefore it would have been obvious to one having

ordinary skill in the art at the time the invention was made to create a lithium battery with the ion-conducting composite of Hying et al. because Kawakami et al. teach use of a nonwoven polypropylene separator as an ion-conducting material in a lithium battery, and furthermore, because Hying et al. teach improved stability in relation to acids and high temperatures of the ion-conducting composite (Hying et al. abstract).

Regarding Claim 23, Kawakami et al. teach the separator is impregnated with an electrolyte (col. 11, lines 21-23).

Regarding Claim 24, Kawakami et al. teach the electrolyte is, among other things, $LiPF_6$ (col. 11, lines 27-31).

Regarding Claim 25, Kawakami et al. teach a battery comprising said separator Kawakami et al. abstract).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Zachary Best whose telephone number is (571) 270-3963. The examiner can normally be reached on Monday to Thursday, 7:30 - 5:00 (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dah-Wei Yuan can be reached on (571) 272-1295. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

zpb

/Dah-Wei D. Yuan/
Supervisory Patent Examiner, Art Unit 4191